CHAPTER 15: COULD HIGH-SPEED RAIL HELP TO ALLEVIATE AVIATION CAPACITY PRESSURES?

What is the Significance of High-Speed Rail to the Washington Aviation System?

The purpose of the high-speed rail assessment is to determine whether high-speed ground passenger transportation development and investment can help the Washington State aviation system by providing a viable alternative to flying between certain city pairs (and thus help mitigate aviation demand levels) and/or by providing improved airport access and connectivity to nearby airports as Sea-Tac International Airport reaches passenger capacity.

The analysis that was performed to evaluate the potential of high-speed ground transportation systems consisted of two tasks:

- First, we defined the most feasible passenger rail service improvements based on recent evaluations of the Washington State railroad network and proposals for improved rail passenger transportation service;
- Second, we examined the ridership potential of high-speed ground transportation service by independently evaluating the passenger forecasts that have been performed in support of rail planning efforts and by estimating future system usage.

Feasibility Assessment

Washington State Rail System

Because of the costs and institutional challenges of right-of-way acquisition, it is very likely that any high-speed ground transportation option in Washington will rely on existing rail right-of-way. Therefore, to assess the feasibility of high-speed alternatives, it is necessary to first look at the overall state rail system. The recent *Statewide Rail Capacity and System Needs Study* succinctly describes the rail system and current operating conditions.[113] This source was used extensively in this feasibility evaluation.

Washington State's 2,500 miles of rail lines are owned and operated by two large freight railroads, a number of smaller regional railroads, and a variety of public entities. Figure 193 shows a map of the Washington State rail system. Two Class I long-haul railroads, BNSF and UPRR, own and operate the most widely used and important rail lines in the state.

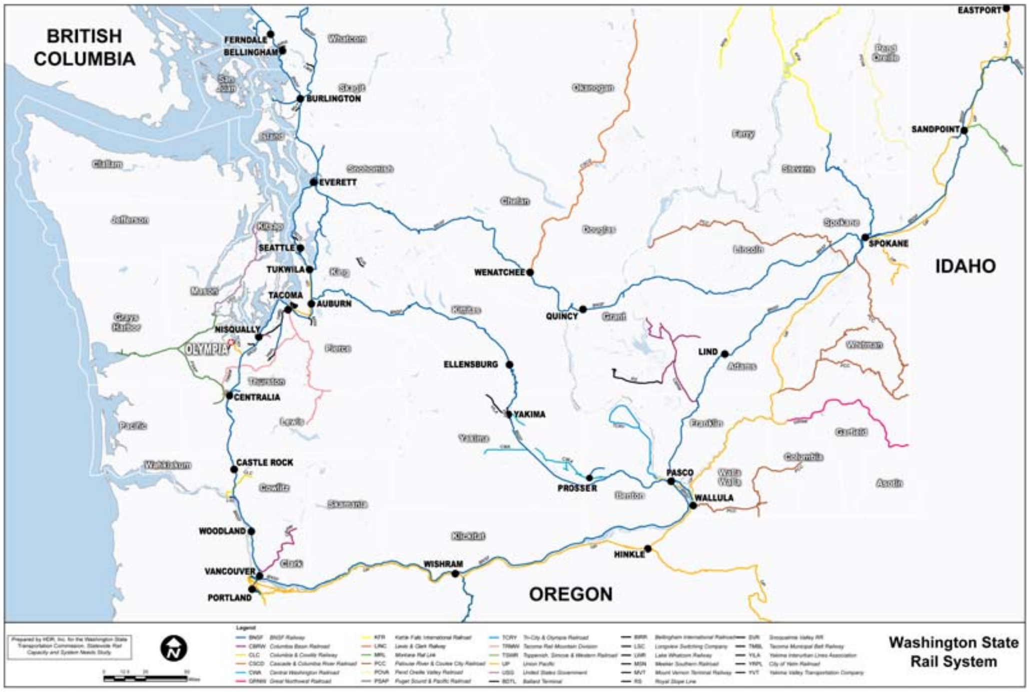
The BNSF owns and operates the three east-west rail lines between the Puget Sound region and the eastern part of the state. East-west rail routing is severely restricted by the presence of the Cascade Mountains, so these three rail routes represent the only viable routes for rail service. The northern most Everett-Spokane line passes through the Cascade Tunnel at Stevens Pass, and is the primary route for double-stack intermodal container traffic to and from the Port of Seattle.

The southernmost route between Vancouver (WA) and Pasco along the north shore of the Columbia River is the primary route for export grain trains inbound to Columbia River ports and serves as a reliever route for intermodal traffic moving from Seattle and Tacoma to points east that cannot go through the congested Stevens Pass. The Auburn-Pasco route that crosses the mountains at Stampede Pass is limited by height restrictions at the Stampede Pass Tunnel, so cannot serve double-stack rail traffic.

UPRR's serves east-west traffic to and from Washington State with a line in Oregon between Portland and Hinkle. UPRR also owns and operates a line between Hinkle and Spokane which runs in parallel with the BNSF Pasco-Spokane service.

[113] Washington State Transportation Commission, Statewide Rail Capacity and System Needs Study: Final Report, prepared by Cambridge Systematics, Inc. with Berk and Associates, Inc., Global Insight, Inc., HDR, Inc., Starboard Alliance Company, and Transit Safety Management (December 2006).

Figure 193: Washington State Rail System



Source: Statewide Rail Capacity and System Needs Study: Final Report (December 2006)

The BNSF and UPRR east-west routes all connect to a north-south spine line that parallels I-5 and extends from the northern border at Bellingham down to Vancouver (WA) and Portland. Most of the I-5 corridor line is owned by BNSF, but UPRR, Amtrak, and Sounder commuter rail services each have operating rights on some or allof the corridor.

The Class I railroads partner with a number of smaller regional, short line and terminal railroads to serve freight shippers and receivers on lower-density rail corridors that would not support Class I railroad service. While some of these short lines and branch services may serve as feasible lines for commuter rail service, these lines do not provide viable connections between population centers for intercity passenger rail service.

Passenger Rail Service in Washington State

Three intercity passenger rail lines provide service to Washington State:

- Amtrak Coast Starlight Service;
- Amtrak Empire Builder Service; and
- Amtrak Cascades Service.

These services are described briefly below.

Amtrak Coast Starlight Service

For the Coach Starlight service, Amtrak operates one train in each direction between Seattle and Los Angeles, serving more than two dozen cities along its 36 hour route. Southbound trains leave Seattle at 9:45 a.m. and serve Tacoma, Olympia-Lacey, Centralia, Kelso-Longview, Vancouver (WA), and Portland, Oregon, before continuing south. The trains are scheduled to arrive in Portland at 1:50 p.m. (4 hours and 5 minutes Seattle to Portland).

Northbound Coast Starlight trains leave Los Angeles at 10:15 a.m. and are scheduled to arrive in Seattle the following evening at 8:45 p.m. Northbound trains are scheduled to leave Portland at 4:20 p.m. (4 hours and 25 minutes Portland to Seattle), but often delays and track improvement projects take the northbound trains significantly off-schedule. Thus, the Coast Starlight does not provide reliable northbound service in Washington State.

The Coast Starlight service is financed and operated by Amtrak, and operates on BNSF tracks in Washington State.

Figure 194: Amtrak Coast Starlight Service

Source: Amtrak.com (accessed March 2007)

Amtrak Empire Builder

Amtrak's Empire Builder provides once daily service between Chicago and Spokane and on to Seattle.

Amtrak's Empire Builder provides once daily service between Chicago and Spokane and on to Seattle. In Spokane, thru car service is provided between Spokane and Portland. So, one train per day serves Spokane, Ephrata, Wenatchee, Everett, Edmonds, and Seattle, and one train per day provides service between Spokane, Pasco, Wishram, Bingen-White Salmon, Vancouver (WA), and Portland, Oregon.

On the northern branch, westbound trains leave Spokane at 2:15 a.m. and arrive in Seattle at 10:20 a.m. Eastbound trains leave Seattle at 4:45 p.m. and arrive in Spokane at 12:32 a.m. On the southern branch, westbound trains leave Spokane at 2:45 a.m. and arrive in Portland at 10:10 a.m. Eastbound trains leave Portland at 4:45 p.m. and are scheduled to arrive in Spokane at 12:13 a.m.

Like the Coast Starlight service, the Empire Builder is financed and operated by Amtrak, and uses tracks owned by BNSF railroad for the Washington State portion of the trip.

Figure 195: Amtrak Empire Builder Service

Source: Amtrak.com (accessed March 2007)

Both the Empire Builder and Coast starlight are operated by Amtrak as long distance scenic routes. Most of the ridership on these routes is derived from passengers with an interest in using the services both for their attractive qualities and their transportation purposes. Use of these services for shorter distance intrastate travel is extremely limited due to the infrequency of service and the poor schedule reliability near the ends of these lines.

Amtrak Cascades

The Amtrak Cascades provides multiple daily trips in each direction between Vancouver (BC), Seattle, Portland, and Eugene, Oregon. Within Washington, the Amtrak Cascades serves Bellingham, Mount Vernon, Everett, Edmonds, Seattle, Tukwila, Tacoma, Olympia-Lacey, Centralia, Kelso-Longview, and Vancouver (WA). Figure 196 summarizes the Amtrak Cascades service.

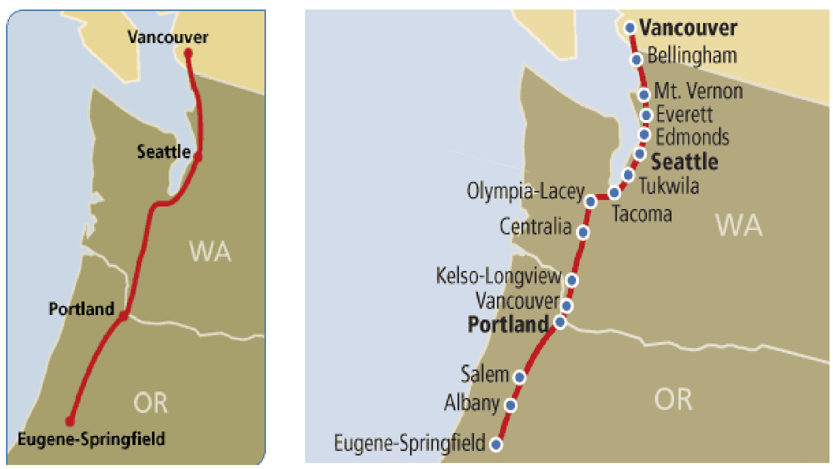
The Amtrak Cascades service is operated by Amtrak, but is co-managed and paid for by the States of Washington and Oregon and Amtrak.

Figure 196: Amtrak Cascades Schedule

Between...	...and	Southbound Daily Trips	Southbound Departure Times	Southbound Arrival Times	Northbound Daily Trips	Northbound Departure Times	Northbound Travel Times
Vancouver(BC)	Bellingham	1	6:00pm	7:40pm	1	9:44am	11:35am
Bellingham	Seattle	2	8:35am	10:55am	2	7:40am	9:44am
			7:40pm	10:05pm		6:40pm	9:05pm
Seattle	Portland	4	7:30am	11:00am	4	8:45am	12:15pm
			11:20am	3:00pm		12:15pm	3:55pm
			2:20pm	5:50pm		2:50pm	6:20pm
			5:25pm	8:55pm		6:15pm	9:45pm
Portland	Eugene	2	6:15pm	8:50pm	2	5:45am	8:20am
			9:05pm	11:40pm		9:00am	11:35am

Source:Amtrak.com (accessed March 2007)

Figure 197: Amtrak Cascades Service



Source: Amtrak.com (accessed March 2007)

Commuter Rail

In addition, Sound Transit's Sounder service provides daily commuter rail service between Seattle and Everett and between Seattle and Tacoma. This service is oriented to daily commuters, rather than to intercity travelers.

Intercity Passenger Ridership

Amtrak's Washington State ridership (measured in terms of station boardings and alightings) in 2005 was about 1,108,000. This figure represents a four percent increase from 2004's 1,068,000 passengers. Figure 198 shows Amtrak on/off counts by station for the Washington state stations.

Figure 198: Washington State Amtrak On/Off Ridership by Station Location

Station	2004	2005	Percent Change	Absolute Change
Seattle	590,041	604,888	2.5%	14,847
Tacoma	106,479	104,993	-1.4	-1,486
Vancouver(WA)	71,474	74,170	3.8	2,696
Bellingham	54,378	56,058	3.1	1,680
Olympia/Lacey	42,362	42,664	0.7	302
Spokane	37,082	40,793	10.0	3,711
Everett	35,760	39,566	10.6	3,806
Edmonds	25,710	27,987	8.9	2,277
Kelso-Longview	20,499	21,448	4.6	949
Mount Vernon	17,003	20,306	19.4	3,303
Pasco	17,875	19,889	11.3	2,014
Centralia	20,184	19,118	-5.3	-1,066
Wenatchee	12,838	15,714	22.4	2,876
Tukwila	11,163	13,535	21.2	2,372
Ephrata	2,483	2,747	10.6	264
Wishram	1,056	2,410	128.2	1,354
Bingen – White Salmon	1,381	1,786	29.3	405

Source: Amtrak, 2006.

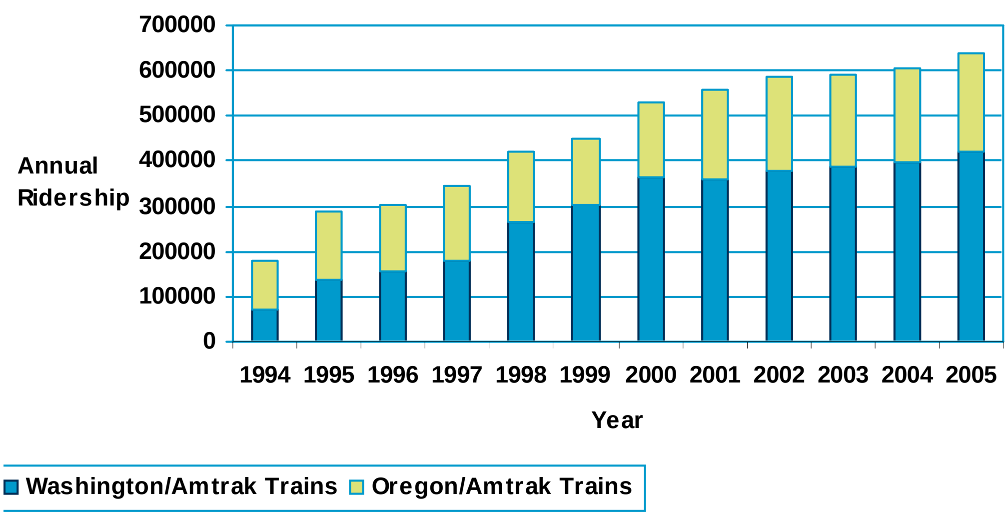
Seattle experienced the greatest absolute growth in Amtrak ridership between 2004 and 2005, adding on average more than 40 passenger boardings and alightings per day. Several of the smaller stations increased ridership by a large percentage, and only two stations had declines from the 2004 ridership levels.

The largest ridership stations are served by the Amtrak Cascades service, as the other Amtrak services in the state are very limited. Figure 199 shows the annual ridership on the Amtrak Cascades. Amtrak and Washington Department of Transportation credit the steady increase in

Amtrak Cascades ridership to a number of improvement milestones that have occurred over the years, as listed in Figure 199, and on several service factors that affect the overall utility of the service, including:

- Increased train frequency;
- Reduced train travel times;
- Increased highway congestion;
- Increased gasoline prices;
- Customer service improvements;
- Smart, local marketing and promotion;
- Custom-built European-style trainsets; and
- Station improvements.

Figure 199: Amtrak Cascades Annual Ridership



Source: Amtrak Cascades Ridership and Station On-Off Information, December 2006.

In 2005, Washington Amtrak Cascades ridership was 420,920, and Oregon Amtrak Cascades ridership was 215,972. The distribution of Amtrak Cascades passenger on-offs among the stations is shown in Figure 200. The passenger volumes are dominated by trips to and from Seattle and Portland. One-third of all Amtrak Cascades trips begin or end in Seattle. One-fourth of the trips begin or end in Portland.

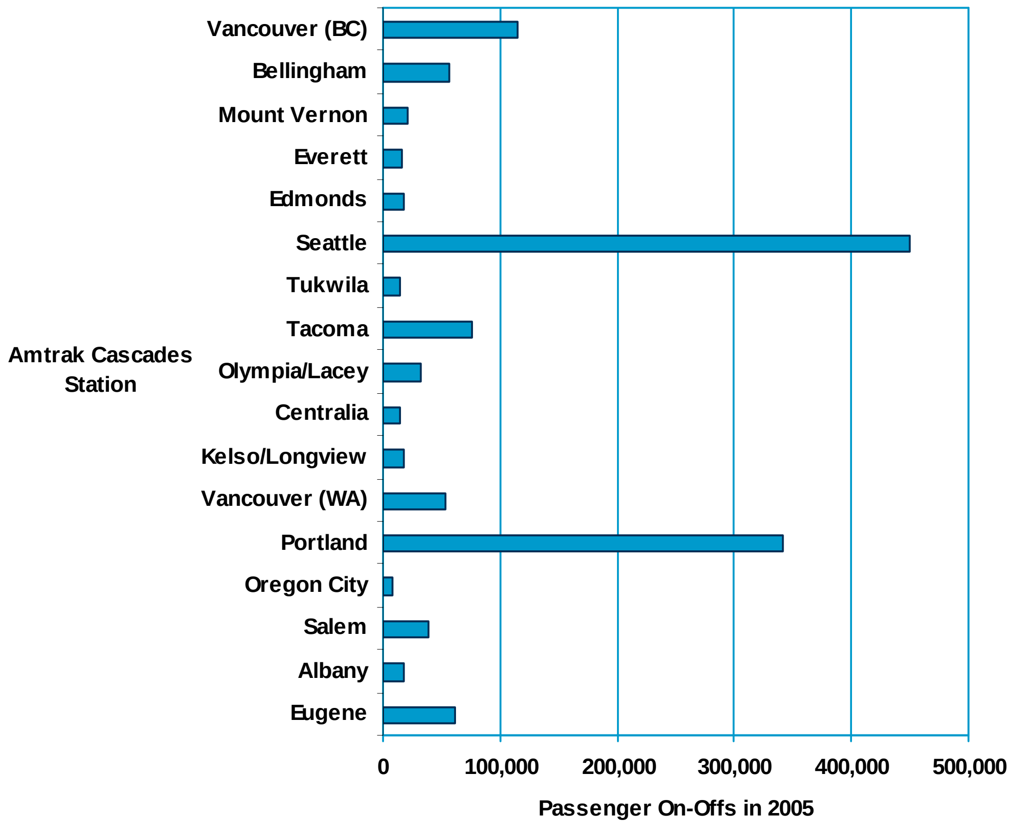
The trip end data provided by Amtrak were used to synthesize station-to-station trip tables using a modified iterative proportional fitting technique. The largest origin-destination station pairs resulting from this analysis are shown in Figure 200. Collectively, these eight origin-destination pairs are estimated to account for about two-thirds of the ridership on the Amtrak Cascades. Based on the reported trip ends, we estimate that about 29 percent of the trips on the Amtrak Cascades are between Seattle and Portland

Figure 200: Amtrak Cascades Service Milestones

Year	Milestone
1993	Amtrak offered one daily Seattle-Portland round trip.
1994	Washington sponsored Amtrak service for the first time.
	Second daily Seattle-Portland round-trip added
	Washington leased temporary European Talgo trains
	Bellingham Station renovation completed
1995	Oregon sponsored its first Amtrak Cascades train
	One of two existing round trips extended south to Eugene
	Service to Vancouver (BC) reintroduced
	Kelso Multimodal Transportation Center completed
1996	Washington leased second temporary Talgo train
1998	Third daily Seattle-Portland round-trip started
1999	Custom-built Talgo trains replace temporary equipment
	New daily service between Seattle and Bellingham
2000	A second round-trip is extended south to Eugene
2001	Tukwila stop added
2002	New Amtrak station in Everett
	Remodeling of Centralia Station completed
2003	Washington purchase third trainset
	Seattle King Street Station renovation began
2004	New station in Mount Vernon
	Cross ticketing program with Sounder trains began
2005	King Street Station renovations continue
	Improved ticket machines introduced

Source: Amtrak Cascades Ridership and Station On-Off Information, December 2006.

Figure 201: Amtrak Cascades Passengers By Station, 2005



Source: Amtrak Cascades Ridership and Station On-Off Information, December 2006.

Figure 202: Top Amtrak Cascades Station Pairs for Ridership, 2005

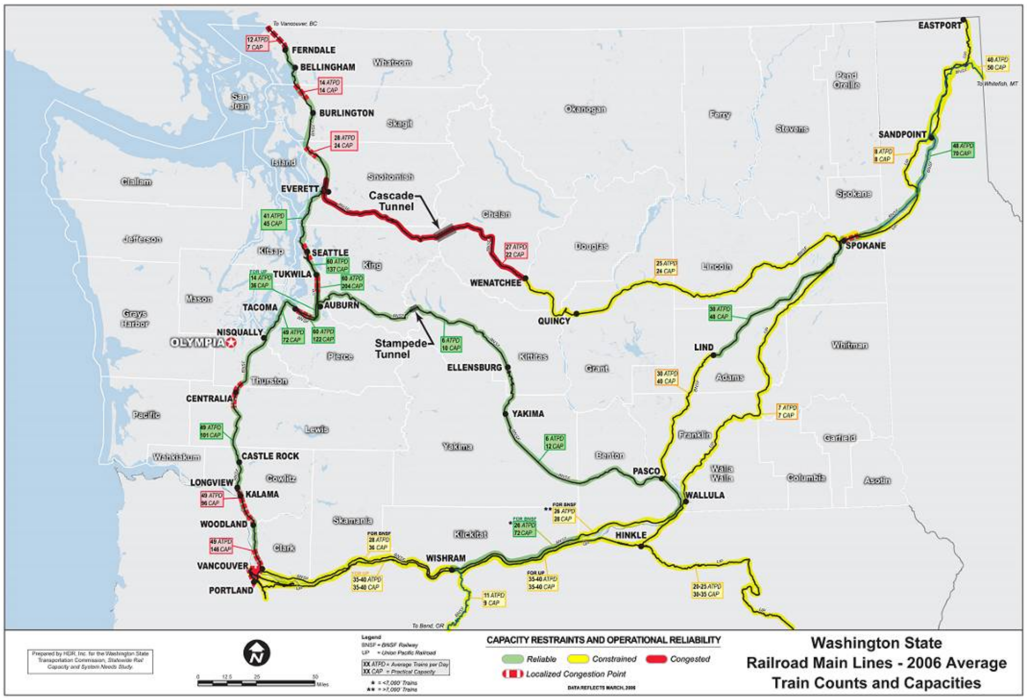
Station 1	Station 2	Annual Trips (Both Directions)	Average Daily Trips (Both Directions)
Portland	Seattle	187,660	514
Seattle	Vancouver (BC)	49,133	135
Tacoma	Seattle	32,790	90
Vancouver (WA)	Seattle	25,959	71
Eugene	Seattle	25,769	71
Seattle	Bellingham	23,522	64
Portland	Tacoma	19,058	52

Source: Cambridge Systematics, Inc. based on Amtrak Cascades Ridership and Station On-Off Information, December 2006.

Statewide Rail Capacity

As shown in Figure 203, the Statewide Rail Capacity study determined that a number of segments of the Washington rail system are nearing capacity and a few have traffic volumes in excess of practical capacity, the volume of service at which trains on the system are moving without incurring significant delay or experiencing significant operational problems. For most rail segments, the rail industry considers practical capacity to be about 60 percent of theoretical capacity, the maximum amount of traffic a segment can accommodate.

Figure 203: Washington State Rail Line Capacity



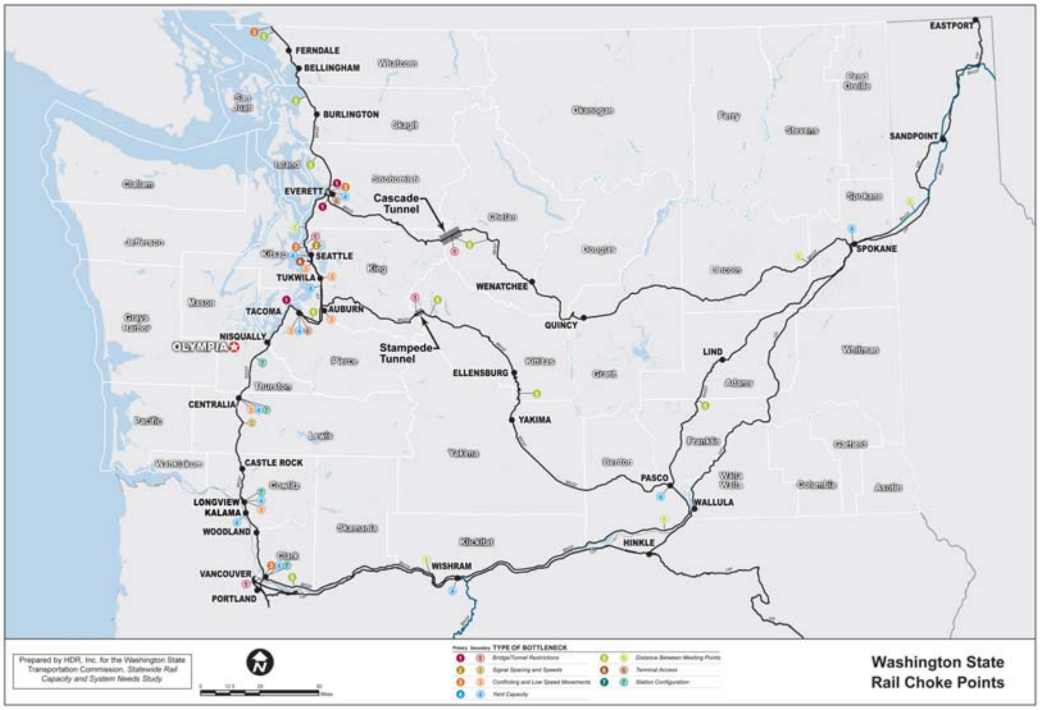
Source: Statewide Rail Capacity and System Needs Study: Final Report (December 2006)

As the figure shows, the east-west line between Everett and the Cascade Tunnel at Stevens Pass is above practical capacity. Analysts estimate that this section is operating at 123 percent of practical capacity. The Vancouver-Pasco line is operating at about 70 percent of practical capacity. The Auburn-Pasco line operates at about 60 percent of practical capacity, primarily because the height restriction on this line and the grades on the line limit its usefulness to freight railroads. The I-5 corridor line operates for the most part at between 40 and 60 percent of practical capacity, but is subject to frequent stoppages and delays when trains tie up the mainline tracks to enter and exit the many branch lines that serve terminals, ports, and industrial yards along the corridor.

About six specific locations on the I-5 corridor have been identified as chronic choke points. These points and other points of congestion in the state are shown in Figure 204. Over the past few years, the effects of these problem locations have been increased delay times for BNSF and UPRR freight trains and declines in the on-time performance of Amtrak

Cascades service. As discussed below, these decreases in on-time performance have not yet manifested into reduced ridership, but they will make the effects of future passenger rail improvement plans more difficult to achieve and less certain.

Figure 204: Washington State Rail Congestion Points



Source: Statewide Rail Capacity and System Needs Study: Final Report (December 2006)

The railroads have instituted a number of operational improvements and changes in response to the capacity limitations on the I-5 corridor and elsewhere in the state, but the Statewide Rail Capacity and System Needs Study concludes that these operational strategies will be insufficient in the long term. Figure 205 shows the rail lines that are predicted to be exceeding practical capacity in the future by the Statewide Rail Capacity and System Needs Study.

Although freight railroads are required to provide passenger trains priority over freight trains, as capacity problems have become more prevalent throughout the country, the level of conflict between the two uses has increased, and freight railroads have begun to require premiums for available train slots from passenger rail services that are seeking to expand their services. These premiums and prospects of more significant delays may limit the ability of services such as the Amtrak Cascades to achieve the potential improvement levels forecast for them.

Figure 205: Washington Rail Lines Forecast to Exceed Practical Capacity, 2015 and 2025

2015	2025
Everett-Burlington	Everett-Burlington
Burlington-Ferndale	Burlington-Ferndale
Ferndale – New Westminster	Ferndale – New Westminster
Everett – Spokane	Everett – Spokane
Vancouver(WA) – Wishram	Vancouver(WA) – Wishram
Wishram – Roosevelt	Wishram – Roosevelt
Roosevelt – Pasco	Roosevelt – Pasco
	Pasco – Spokane (BNSF)
Pasco (Wallula) – Spokane (UPRR)	Pasco (Wallula) – Spokane (UPRR)
Spokane – Sandpoint (ID) (UPRR)	Spokane – Sandpoint (ID) (UPRR)
Auburn – Yakima	Auburn – Yakima
Yakima – Pasco	Yakima – Pasco

Source: Statewide Rail Capacity and System Needs Study: Final Report (December 2006).

Notes: Forecasts assume operational improvements by railroads, and 8,000 foot trains.

Passenger Rail Plans and Opportunities

In the late 1990's, the Federal Railroad Administration designated the Amtrak Cascades corridor as one of the nation's most promising high speed ground transportation corridors. Recent analyses by the U.S. Department of Transportation reviewed potential high speed ground technology options, including:[114]

- Incremental High Speed Rail – Improved rail service that makes use of existing railways upgraded for enhanced capacities and top speeds in the range of 90 to 150 miles per hour;
- New High Speed Rail – Improved rail service requiring the installation of new trackage on dedicated alignments for most of its distance that would provide service at top speeds of up to 200 miles per hour;
- Maglev (magnetically-levitated) Systems – Advanced transportation technology in which magnetic forces lift, propel, and guide a vehicle over a specially designed guideway at cruising speeds of 300 miles per hour or more.

[114] U.S. Department of Transportation Federal Railroad Administration, *Report to Congress: Costs and Benefits of Magnetic Levitation* (September 2005).

Although the higher speed systems would be expected to attract more riders, the need for dedicated alignments and new guideways would increase the cost of constructing the system dramatically. The Federal railroad Administration study estimated the cost per mile of new high speed rail to be more than five times that of incremental high speed rail, and the cost of maglev to be more than nine times that of incremental high speed rail.

The ridership increases that would be expected from the higher speed services do not make up for these significant cost differences, so both the U.S. Department of Transportation and Washington State Department of Transportation have both concluded incremental high speed rail improvements would be the most reasonable for the Amtrak Cascades corridor. The benefit-cost ratio of incremental high speed rail improvements in the corridor was estimated by FRA to be 2.5 times that of new high speed rail service and 4 times that of a maglev system.

The higher speed services would also have the potential for increasing the length of the corridor that could be served effectively by the high speed ground transportation service, but even the fastest maglev services become substantially less competitive with air service at distances above 500 to 600 miles. Thus, HSGT of any type will not provide meaningful competition with air service for any service between washington and the larger cities in California that could be served by an extension of the Amtrak Cascades corridor.

In February 2006, the Washington State Department of Transportation issued the Draft Short-Range Plan for Amtrak Cascades and the Draft Long-Range Plan for Amtrak Cascades. The short range plan describes several planned improvements along the Pacific Northwest Rail Corridor (I-5 Corridor) through the year 2015, including additional mainline tracks, siding upgrades, junction improvements, high-speed crossovers, and additional storage tracks. Funding for these improvements has been secured although project cost estimates are conceptual and may change over time.

The long range plan outlines phased intercity passenger rail service expansions along the corridor through the year 2023. The improvement phases are summarized in terms of service goal timetables that could result as the improvements phases are completed. Figure 206 summarizes the phased service goal timetables.

The projected costs shown in the table are sums of the estimates for many discrete improvement projects identified by DOT as necessary to achieve the service goals. The specific project improvements would be funded by several agencies, including the DOT, but also including the Canadian and

Oregon governments, the railroads, and Sound Transit. No long term financial commitments have been made to this point. Therefore, the achievement of these service goals will require a coordinated and sustained effort by several different entities with several different agendas. The uncertainties of the project costs and the allocation of system improvement benefits across the different funding entities will make the achievement of the service goals very challenging.

Figure 206: Washington DOT's Amtrak Cascades Service Goal Timetables

Timetable	Approximate Completion Year	Projected Improvement Costs (All entities)	Service Goal for Daily Round Trips	Service Goal for Scheduled Running Times	Maximum Speed	Number of Trainsets
Timetable A	2007					5
Seattle – Portland		$316.6 million	4	3:25	79	
Seattle – Vancouver (BC)		$8.4 million	2	3:55	79	
Timetable B	2009					6
Seattle – Portland		$623.2 million	5	3:20	79	
Seattle – Vancouver (BC)		$71.8 million	2	3:55	79	
Timetable C	2012					7
Seattle – Portland		$871.7 million	8	3:00	79	
Seattle – Vancouver (BC)		$1,022.6 million	3	3:25	79	
Timetable D	2016					9
Seattle – Portland		$546.7 million	10	2:55	110	
Seattle – Vancouver (BC)		None	3	3:25	79	
Timetable E	2018					11
Seattle – Portland		$349.7 million	12	2:45	110	
Seattle – Vancouver (BC)		None	3	3:25	79	
Timetable F	2023					12
Seattle – Portland		$1,260.6 million	13	2:30	110	
Seattle – Vancouver (BC)		$1,584.1 million	4	2:37	110	

Source: Washington State Draft long Range Plan for Amtrak Cascades, February 2006.

The state/Amtrak financing relationship for Amtrak Cascades is part of a trend that has sought to reduce Federal subsidies for intercity passenger service. Recent proposed Federal budgets would severely restrict Federal investments in Amtrak and intercity rail, and though Congress has restored funding for Amtrak to some degree, there is clear pressure on states to carry more of the burden of intercity rail capital and operating costs. Thus, it is likely that proposed improvements in the passenger rail system will require the state and other local entities to take on the lion's share of the risk in recouping investments through increased farebox recovery.

Among the most institutionally-challenging improvement projects will be the significant investment by the Canadian Federal government and/or the government of British Columbia to either improve the New Westminster Rail Bridge over the Fraser River (a one-track swing bridge with limited clearance above the navigable river channel and very limiting speed and service availability restrictions) or to re-route passenger trains to a different northern terminus in Surrey and to make investments in providing local connections to downtown Vancouver.

On a smaller scale, a new siding track in Delta (BC) is needed to create sufficient rail line capacity to allow for one more daily passenger train between Seattle and Vancouver. In 2007, the government of British Columbia announced a construction agreement with BNSF Railway and Amtrak for the new siding track that will result in an additional daily round trip train between Seattle and Vancouver in 2008. This new daily round trip will complement the daily round trip between Seattle and Vancouver that has been operating since 1995.

Based on analyses performed by Washington DOT and the U.S. DOT that assumed passenger fares would remain the same over time in real terms, the projected improved service levels will greatly increase ridership levels, and reduce the level of annual subsidy required for the service.

In addition, there is some indication of initial progress on addressing the rail freight congestion in the I-5 corridor. On February 26th of this year, the Port of Seattle, King County, and BNSF signed a Memorandum of Understanding, which in part endorses the concept of making Stampede Pass usable for double-stack train operations:

> *The parties believe that freight mobility is critical to the economic viability of the region, and it is vital that infrastructure improvements be implemented to enhance future freight mobility and enable growth prospects for intermodal freight service in the region and serving the Port. Toward that end, the parties agree that clear-cutting the railroad tunnel at Stampede Pass,*

Washington is vital to improving the competitiveness of the region and the Port, and that the parties will work toward achievement of that goal and actively support initiatives to accomplish that increase in capacity.

The Memorandum of Understanding is not a binding statement, but the Governor has proposed to make a $25 million investment to help renovate Stampede Pass.

These improvements could improve the level of congestion that Amtrak Cascades trains face in the I-5 corridor as fewer intermodal freight trains would need to travel south to Vancouver (WA) in order to travel east.

In addition to the potential rail system improvements, several proposed transit improvements in the corridor will enable intermodal connections between the rail system and airports. Portland's Max light rail expansion will bring Max service to Portland's Union Station (Amtrak) in 2009. The Max Red Line serves Portland International Airport, and the Yellow and Green Lines will come to Union Station. This means that passengers will have a transit connection between the improved Amtrak Cascades and Portland International Airport (PDX), but that they will need to make a transfer from one Max line to another at Portland's Pioneer Square to complete the trip.

The connection between Amtrak Cascades and SeaTac International Airport will occur at two places. Passengers will be able to transfer between intercity rail and Sound Transit's Link light rail at King Street Station / Union Station in downtown Seattle (one block apart). Link light rail will provide service to and from SeaTac International starting in 2009.

The other connection will be at Tukwila. The intercity/commuter rail station is about four miles east of SeaTac International Airport. In the future, this four mile connection may be made by private sector, over-the-road-providers or a dedicated shuttle bus under contract to Amtrak or some other entity. The buses would travel on Interstate 405, State Route 518, and State Route 99. Permanent station plans are under development, and are somewhat dependent upon additional funding that could come with voter approval in November 2007.

The final airport/rail connection will be in Vancouver (BC). The new "Canada" line is under construction and will take people between downtown's Waterfront Station and Vancouver International Airport starting in 2009. Amtrak intercity passengers will transfer to the Vancouver Skytrain across the street from Pacific Central Station (Amtrak), then transfer again to the Canada Line (light rail) at Waterfront Station.

High Speed Rail Feasibility

Certainly, the key opportunity for implementing high quality high-speed rail service in Washington is to complete the Long Range Plan for Amtrak Cascades service. The mounting rail congestion levels and the uncertainties of project costs and funding sources make the plan implementation challenging, but there is reason to believe that these investments could have substantial benefits to riders and may actually help reduce subsidy levels in the long run. The improvement of the Amtrak Cascades service was the primary high-speed option evaluated in the ridership analyses.

The other intercity rail corridors in the state serving the smaller metropolitan areas are projected to be heavily congested with freight traffic in the future, so the implementation of new passenger services with desirable scheduling will be very difficult to achieve. Perhaps, the one feasible opportunity in this vein will be to take advantage of the potential improvements on the Auburn-Pasco line to introduce service between Seattle and Yakima and the Tri-cities. It is important to note that the proposed line and tunnel improvements are aimed at improving freight movement on the line, not potential passenger movements, so offering passenger service may be even more difficult than in other places in the state, but it is possible that as plans for the line are further fleshed out, passenger service may be possible. In the ridership analysis, we conducted a less detailed planning assessment of a hypothetical service on this line.

Market Demand Assessment

Forecasts of Amtrak Cascades Ridership

Analyses by Washington DOT forecast the ridership on Amtrak Cascades as the projected improvements are made. Figure 207 summarizes these forecasts. The Seattle-Vancouver section of the corridor is projected to grow by almost 500 percent to more than 900,000 riders per year, and the Portland-Seattle section is expected to grow 1.9 million riders per year, a growth of over 400 percent. The DOT forecasts that with the introduction of direct Portland-Vancouver (BC) service, an additional 133,000 riders per year will be captured.

Figure 207: Washington DOT / U.S. DOT Ridership Forecasts for Amtrak Cascades (Assuming Full Improvements)

Corridor Segment	2005	2023
Vancouver (BC) – Seattle	163,753	945,700
Seattle – Portland	374,008	1,916,400
Vancouver (BC) – Portland	-	133,200

Source: Washington State Draft Long Range Plan for Amtrak Cascades

The forecasts of station activity (ons/offs) are shown in Figure 208. Seattle and Portland activity continues to dominate the corridor, but activity in Vancouver is expected to rise significantly with the planned improvements.

Figure 208: Washington DOT / U.S. DOT Station Activity Forecasts for 2023 (Assuming Full Set of Improvements)

Amtrak Cascades Station	Passenger Ons/Offs, 2023
Vancouver (BC)	710,750
Bellingham	265,750
Mount Vernon	110,750
Everett	142,250
Edmonds	199,500
Seattle	1,918,750
Tukwila	140,250
Tacoma	402,000
Olympia / Lacey	180,250
Centralia	75,500
Kelso / Longview	106,500
Vancouver (WA)	260,750
Portland	1,458,250

Source: Washington State Draft Long Range Plan for Amtrak Cascades

The significant increase in projected ridership is a result of both projected significant increases in the population and employment in the corridor and the major service level improvements that would be enacted as a result of the infrastructure upgrades. For ridership forecasting, the rail fares were held constant in real terms, while the travel times and frequencies were improved substantially. Holding the fares constant allows the effects of the service improvements to be measured more clearly. Alternative operating scenarios with real increases in the passenger fares may need to be developed to increase revenue capture over time as service improvements are introduced incrementally over time.

Application of the California High-Speed Rail Model System to Amtrak Cascades

As shown in Figure 209, the application of the California High Speed Rail Model to the Amtrak Cascades corridor resulted in forecasts that were generally consistent with the previous Washington DOT / U.S. DOT forecasts. The total ridership forecast for the Amtrak Cascades with the model for 2030 was 3,448,300. The model forecasts higher ridership than had previously been forecast in the Portland-Seattle and Portland-Vancouver (BC) segments, and slightly lower ridership than had previously been forecast for the Seattle-Vancouver (BC) segment. Some of the higher ridership is likely due to the difference in forecast years, but several significant model assumptions also affected the forecasts. Thus, the forecasts should be viewed as rough estimates. The application of the alternative modeling approach generally supports the overall results of the forecasting effort.

Figure 209: Approximate Ridership Forecasts for Amtrak Cascades Based on High Speed Rail Model

Corridor Segment	2005	2030
Vancouver (BC) – Seattle	163,753	888,000
Seattle – Portland	374,008	2,224,400
Vancouver (BC) – Portland	-	335,900

Source: Cambridge Systematics estimates

The forecasts of station activity (ons/offs) are shown in Figure 210. The station forecasts vary to a larger extent from the previous forecasts for smaller stations because of different assumptions about station access areas. The importance of Seattle and Portland in the corridor is relatively consistent between the two forecasts. The DOT forecasts project that 32 percent of the corridor activity will take place at Seattle and that 24 percent of the on/offs will be at Portland. The new forecasts predict that these percentages will be 34 and 27, respectively.

Figure 210: Approximate Station Activity Forecasts for Amtrak Cascades Based on High Speed Rail Model

Amtrak Cascades Station	Passenger Ons/Offs, 2030
Vancouver (BC)	656,900
Bellingham	323,300
Mount Vernon	86,500
Everett	204,100
Edmonds	151,500
Seattle	2,341,600
Tukwila	83,400
Tacoma	498,300
Olympia / Lacey	223,900
Centralia	56,400
Kelso / Longview	78,100
Vancouver (WA)	353,800
Portland	1,838,800

Source: Cambridge Systematics estimates

Even with significant increases in train speeds, auto travel will still provide the fastest access to Sea-Tac, Portland, and Vancouver

As the previous and new forecasts are relatively consistent with each other, we conclude that there is indeed potential for the high level of ridership increases that have been projected for the Amtrak Cascades corridor. These increases are due to significant increases in the population and employment in the corridor and the major service level improvements that would be enacted as a result of the infrastructure upgrades, provided that the plans can be implemented. If the improvements do not prove to be possible, the projected ridership increases are not likely to occur, and the service is likely to continue to grow in ridership by small amounts from year to year.

Rail / Air Connectivity

The combined Amtrak Cascades Corridor improvements and public transit service improvements will provide travelers in the I-5 corridor with a potential auto-free means of accessing international airports in Portland, Seattle, and Vancouver. Since this new connectivity will have some utility for some travelers, we examined a range of potential airport access options and compared the relative levels of service of the new rail options with the auto options that would otherwise need to be used to reach the alternative non-local airports. Figure 211 demonstrates this comparison for two locations' access to Portland Airport.

Rail improvements will not make travelers more likely to seek alternative airports to Sea-Tac

The rail/transit access option would provide a traveler a cost advantage, particularly for longer duration trips for which airport parking costs would accrue for the auto access option. On the other hand, even with the significant increases in train speeds, the auto travel times are superior to those of the rail/transit option. In addition, the rail/transit options will require station access times (either walking or driving) and multiple transfers between vehicles, which can be particularly onerous for airport access trips in which baggage is being transported. An additional challenge for the rail/transit option is that the air schedule and rail schedule for the trip need to align. Flights that leave early in the morning or late at night cannot be feasibly covered by the rail access/egress option, and even if the coordination can be performed, it may require significant additional waiting time.

It is because of these limitations that commuter rail and intercity rail airport access trips represent only a small share of trips at airports where this is a feasible access/egress option. Because the rail-based airport access option does not represent a substantial improvement to airport access, we would not expect the rail improvements to affect the likelihood that travelers will seek alternative airports to any greater degree than they otherwise would.

Figure 211: Representative Portland Airport Access Trips

	From Seattle		From Centralia	
Service Levels	Auto Access	Rail / Transit Access	Auto Access	Rail / Transit Access
Distance (miles)	170		90	
Cost				
Auto operating ($0.15 per mile)	$26.25		$13.50	
Rail fare		$44.00		$28.00
Transit fare		$2.00		$2.00
Airport parking	$24 * days		$24 * days	
Travel Time				
Auto time	2 hrs 50 min		1 hr 30 min	
Rail time		2 hrs 30 min		1 hr 17 min
Transit time		55 min		55 min
Transit wait time		20 min		20 min
Other factors				
Vehicle Transfers	1	3 or 4	1	3 or 4
Station access time	0	0 – 20 min	0	0 – 20 min
Availability	Always	Per schedule	Always	Per schedule

Source: Estimates based on Timetable F rail assumptions and current operating characteristics.

Analysis of the Potential East-West Intercity Rail Corridor

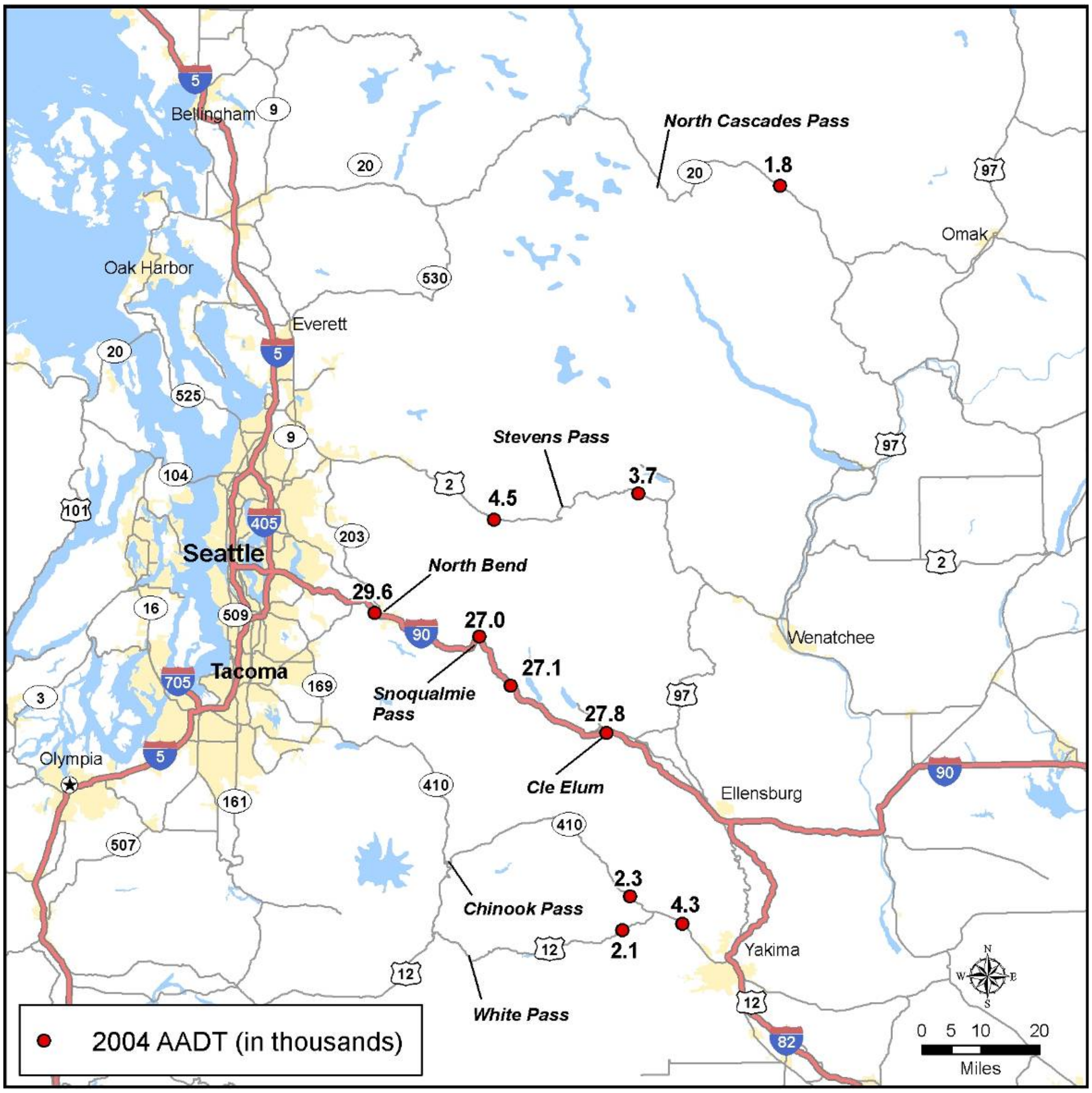
As discussed above, it is possible that rail improvements at Stampede Pass may allow for more reliable east-west freight train service, and that these improvements may allow for the introduction of passenger rail service between Seattle, Yakima, and the Tri-Cities. We conducted a simplified analysis of the ridership potential of such a service, assuming that it would be similar to the service currently offered between Seattle and Vancouver (BC).

Figure 212 shows the primary east-west highway routes crossing the Cascade Mountains. Interstate 90 (I-90) is the principal east-west highway corridor in Washington State connecting the Puget Sound region to Yakima, the Tri-Cities, other cities in Eastern Washington, as well as to the rest of the United States. I-90 crosses the Cascade Mountains at the Snoqualmie Pass.

In 2004, the pass carried 27,000 vehicles on an average daily basis. This is almost triple of all other passes in Washington combined. I-90 is also a major freight corridor with commercial vehicles consisting of about 15 percent of the average weekday traffic. The closest pass to I-90 is Stevens Pass on SR 2 that carries 4,500 vehicles on an average day, while the less competitive crossings of North Cascades or Rainy Pass (SR 20) and SR 12/SR 410 (Chinook Pass and White Pass) carry about 1,800 and 4,300 vehicles on an average day, respectively. Rainy Pass and Chinook Pass are closed in the winter.

For trips between Seattle and Yakima and points beyond, the I-90 route is significantly shorter than the alternative routes, both in terms of distance and time (2.15 hours via I-90 versus 3.27 hours for the best alternative route; 142 miles via I-90 versus 163 miles for the alternative). Therefore, it is likely that any direct auto trips between Seattle and Yakima and between Seattle and the Tri-cities use I-90 and the Snoqualmie Pass.

Figure 212: Average Annual Daily Traffic Estimates for Key East-West Routes in Washington



Source: Washington State Department of Transportation.

Figure 213 displays historical count data from WSDOT's automated data collection sites along I-90 as well as the average annual growth rates.

Figure 213: I-90 Historical Count Data

Year	R039 – w/o 468 Avenue S.E. – North Bend	S901 – At Tinkam Road	S902 – At SR 906 Bridge	S903 – At Cabin Creek Road	B04 – West of Cle Elum Off-Ramp
1996	27,900	24,493	20,541	N/A	N/A
1997	29,252	25,349	N/A	N/A	23,602
1998	30,137	25,657	22,436	N/A	24,271
1999	30,553	N/A	N/A	24,241	23,951
2000	N/A	N/A	25,527	25,172	25,119
2001	30,864	N/A	25,698	25,678	26,043
2002	31,564	28,961	27,087	26,968	27,230
2003	32,047	29,262	27,440	N/A	27,285
2004	31,482	29,568	26,985	27,105	27,778
Average Annual Growth Rates to 2004					
From Year					
1996	1.5%	2.4%	3.5%		
1997	1.1%	2.2%			2.4%
1998	0.7%	2.4%	3.1%		2.3%
1999	0.6%			2.3%	3.0%
2000			1.4%	1.9%	2.5%
2001	0.7%		1.6%	1.8%	2.2%
2002	-0.1%	1.0%	-0.2%	0.3%	1.0%
2003	-1.8%	1.0%	-1.7%		1.8%

Source: Washington State Department of Transportation

The average annual rate of growth in daily traffic at these stations from 1996 to 2004 is shown to have been between 1.5 and 3.5 percent. The relatively high growth experienced from 1996 to 2002 had a significant influence on this overall average. For instance at Station 902, traffic increased from 20,541 in 1996 to 27,087 in 2002 at an average rate of 4.7 percent annually. From 2002 to 2004 traffic has decreased at this station. Growth at the other four stations shown has followed a similar pattern with recent growth significantly reduced as compared to the growth experienced in the late nineties.

The assumed annual percent rate of growth used to estimate future year traffic for use in the intercity analysis is shown below:

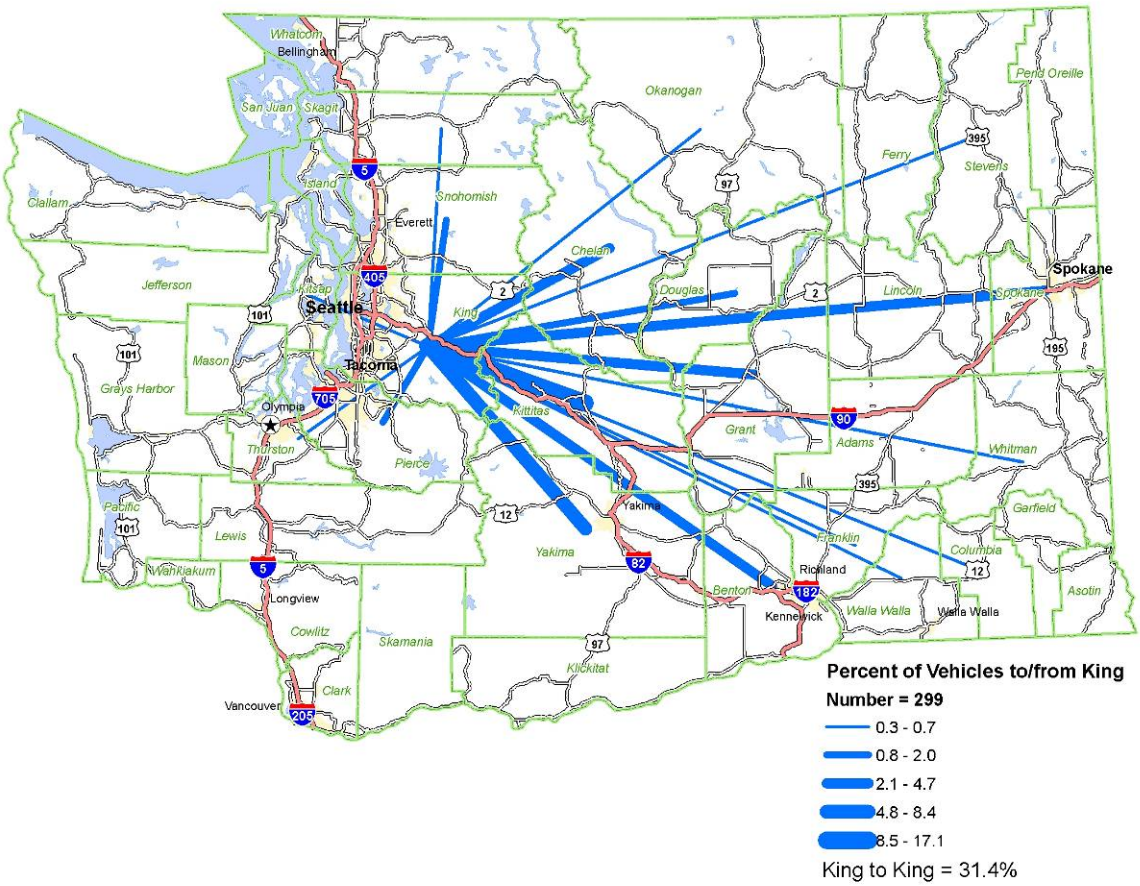
- 2004-2010 – 2.5 percent;
- 2010-2020 – 2.0 percent;
- 2020-2025 – 1.5 percent; and
- 2025-2030 – 1.0 percent.

We used existing traffic count data and travel pattern information obtained from WSDOT's origin and destination survey on I-90 (conducted in 2005)[115] as the basis for understanding travel patterns across the pass, and between Seattle and Yakima and the Tri-Cities.

King County was at least one end of the trip for the highest number of origins and destinations using I-90 near North Bend. Figure 214 displays the desire lines for these King County trips. A significant number of these trips were internal to King County, meaning that one end of the trip was east of North Bend, but still west of the Snoqualmie Pass (the highest point of the Snoqualmie Pass is the eastern boundary of King County). For trips going all the way across the Snoqualmie Pass, the highest percentage of trips was recorded to and from Kittitas and Yakima counties. The next tier of movements includes those to and from Spokane, Benton, Grant, and Chelan Counties.

[115] The mail back survey on I 90 was located at 436th Avenue S.E. in North Bend and in the direct vicinity of the proposed eastbound tolling zone. Data was collected via license plate video recording on May 17, 2005 between 6:00 a.m. and 7:00 p.m. Legible license plate reads were matched up with the Department of Licensing (DOL) database and mail back travel surveys were then sent out to the registered owners of the videotaped license plate numbers. The survey also included questions beyond origin and destination such as trip purpose, trip frequency, and vehicle occupancy.

Figure 214: Desire Lines for Vehicle Trips to and From King County Through Snoqualmie Pass



Based on the expansion of the vehicle intercept survey results to the AADT of 29,600 vehicles (bidirectional), it is estimated that there are 2,467 vehicle trips between King County and Yakima County on an average day. There are 1,644 daily vehicle trips between King County and Benton County, and about 75 daily vehicle trips between King County and Franklin County, the counties that include the Tri-cities region. The American Travel Survey estimates that the average vehicle occupancy for long distance trips within the State of Washington is 1.8 persons per vehicle, so there are about 4,440 (2,467*1.8) daily person trips in vehicles between King and Yakima Counties, and about 3,095 daily person trips in vehicles between King County and Benton/Franklin Counties.

Air travel in the corridor accounts for a much smaller percentage of travel. The U.S. DOT ten percent air passenger survey indicates that in 2005 about 39,680 air passengers flew between Seattle and Pasco (an average of 109 passengers per day) and 26,020 air passengers flew between Seattle and Yakima (71 passengers per day).

Since the Seattle-Yakima corridor is about the same distance as the Seattle-Vancouver (BC) corridor, and initial east-west rail service is likely to be similar in terms of times, fares, and frequencies as the current Seattle-Vancouver (BC) service, we estimated potential east-west ridership by applying a similar rail-to-auto mode share as is currently observed in the Seattle-Vancouver travel market to the estimated number of trips in the east-west corridor. Figure 215 shows the estimated potential ridership of an initial high speed rail service in the corridor.

Figure 215: Rail Passenger Ridership Estimates for East-West Rail Corridor (Annual Passengers)

Origin-Destination Pair	2020	2030
Seattle – Yakima	102,500	116,000
Seattle – Tri-cities	57,100	64,700
Yakima – Tri-cities	21,100	23,900

Source:	Cambridge Systematics preliminary estimates.

Key Findings

High-speed rail not an adequate option for relieving airport congestion.

The key finding of this analysis is that while high-speed ground transportation systems offer the potential to enhance the mobility of Washington residents and visitors traveling between the state's cities and other nearby cities and activity centers in Washington, Oregon, and British Columbia, feasible high-speed systems will not alleviate airport congestion levels by a significant amount.

Intercity passenger rail service in Washington State is currently limited to state-supported Amtrak Cascades service between Vancouver (BC), Seattle, Portland (OR), and Eugene (OR) and nominal Amtrak east-west service on long-distance oriented trains.

Improvements to intercity rail service limited by rail network capacity.

Potential future improvements in intercity rail service are limited by the state's rail network capacity issues, particularly for east-west routes, and by the geographic distances between major population centers. However, the Department of Transportation has developed an ambitious long-range plan for service improvements in the Amtrak Cascades corridor. The proposed improvements are projected by the Department to attract significantly more riders than the current service, and our ridership analyses generally support these forecasts. However, the number of SeaTac International Airport passengers diverted to the improved rail system represents only a very small percentage of the overall number of air passengers that will use the airport.

Rail service levels not sufficient to shift airport choice patterns

Furthermore, even though the Amtrak Cascades Corridor improvements, coupled with ongoing transit improvements in Vancouver (BC), Seattle, and Portland (OR) will provide for potential improvements in air-rail connectivity and in passengers' abilities to use alternative airports, the service levels that will be offered will not be sufficiently superior to existing auto based airport access options to justify significant shifts in airport choice that will not otherwise occur with a congested aviation system.

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